InGaZnO based TFT structures for active matrix addressing

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1. Introduction

We present the results on a TFT active-matrix structure based on the InGaZnO (IGZO) semiconductor compound formed by the magnetron plasma-chemical deposition method. Their structural, morphological and electro physical properties were studied.

InGaZnO is an amorphous n-type transparent conductive oxide. The main advantage of IGZO over organic semiconductors is the stability of their properties and the significantly higher mobility of charge carriers.

Thus, the balance of the required properties inherent in IGZO makes it a promising material for optoelectronics, photonics and display technology.

2. Test structures

Arrays of TFT test structures differing in the thickness of an active IGZO layer, width and length of a gate were formed on a 60.0x48.0x1.1 mm glass substrate. First, a 100 nm buffer Si_3N_4 layer was deposited by plasma chemical deposition from the gas phase (PCO). Next, a 200 nm Mo gate was formed by magnetron deposition. The gate dielectric SiO_2 with a thickness of 100 nm was formed by PHO method. The 75 and 150 nm IGZO layers were magnetron sputtered. The 200 nm thick drain / source regions were formed by magnetron sputtering as well. Finally a 500 nm passivating SiO_2 layer was formed using PEC method. Contact windows were opened using "dry" reactive ion etching.

Figure 1 shows a view of a TFT test structure in a section.

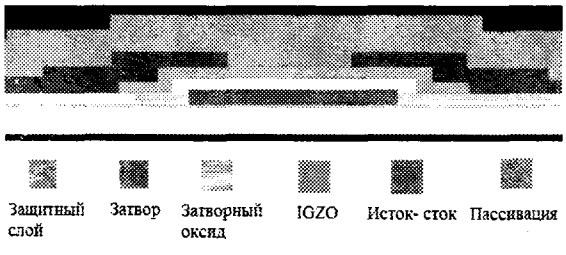

Figure 1: Schematic view of a test TFT structure

3 Experimental results

Figure 2 shows typical current-voltage characteristics of a test sample.

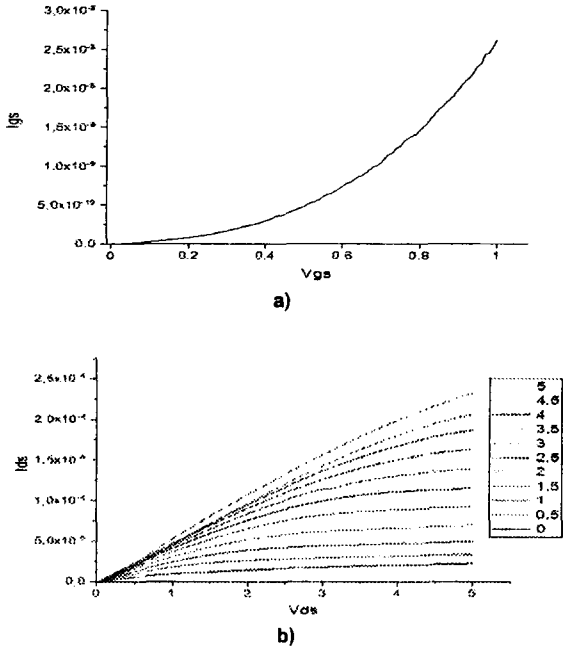

Figure 2: Current-voltage characteristics of TFT test structures with an IGZO layer: a - drain-gate characteristic; b - stock characteristics at different voltages on the gate

Mobility of IGZO material was determined by four probe method using Hall Ecopia Hall Effect Measurement Systems HMS-5000. Typical values of carrier mobility in the active layer of TFT test structures were in the range 4–5 cm^2 / V s.

Thus, obtained layers were characterized by high mobility of the charge carriers and transparency, which allow to use them for manufacturing of new generation of LCD and OLED displays.

4. Acknowledgements

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5. References

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